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Boundary dialogues in user-centric innovation

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ABSTRACT

This paper is based on a user-centric innovation project, Free2Ride, which is seen as an example of community interaction that overcomes boundaries. Free2Ride aimed at developing a piece of ICT safety equipment consisting of a sender (on the horse) and a receiver (application in a smartphone) to be used by equestrian club members during their everyday riding activities. We will answer the research question of what the characteristics of a boundary dialogue in user-centric innovation activities are. The aim of the paper is to propose a model describing the characteristics of boundary dialogue in user-centric innovation that involve different communities of practices such as ICT developers, users and researchers. We applied a combination of research approaches consisting of action research and engaged scholarship approach. The theoretical framework for analyzing our findings is communities of practices with a specific interest in boundary spanning and learning dialogues. Our contribution is a model describing the characteristics of boundary dialogues in user-centric innovation. An important element of that model is the mental wandering, inwards and outwards, by core members in a community. We discuss the temporal as well as the symbolic nature of the mental wandering during the boundary dialogue in user-centric innovation activities.

Keywords (Required)

innovation, community of practice, user-centric, boundary dialogue, equestrian clubs.

INTRODUCTION

The research presented in this paper has as a departure point an interest how actors from various groups share insight and co-create knowledge during a user-centric innovation process. One way to approach these sharing of insights is to understand boundaries and the bridging of boundaries in such contexts. Much research on innovation and boundaries deals with how external information is transformed into internal practice in order for the organization to be innovative and perform better. Two important concepts within this area are: absorptive capacity and boundary spanning. In the boundary spanning literature, boundary spanning (Cohen and Levinthal 1990) is activities that gather information at the interface of the firm's external environment and translate and communicate that information to managers and employees internal to the firm. In the field of information systems research, there are many articles that address boundary spanning, see for instance (Levina and Vaast 2005; Lindgren et al. 2008). Cohen and Levinthal (1990) describes absorptive capacity as the ability to recognizing new, valuable, external information, assimilating it and applying it to commercial ends.

Another important approach in understanding the bridging of boundaries is the community of practice (COP) perspective (Lave and Wenger 1991), which is also related to learning and innovation (Hildreth and Kimble 2004). Innovation is closely related to boundary spanning and learning is related to boundary relations (Wenger 1999); it is therefore natural to explore an innovation process from a COP perspective. In the theory of COPs the bridging of boundaries is described as a duality (Wenger 1999) between brokering and the use of boundary objects (Star 1990; Levina and Vaast 2005). Brokering and boundary spanning is to an extent described as inward process from an organizational or a COP perspective. In this paper we want to identify not only the inward process of how innovation and knowledge sharing activities go, but also how the dynamics in the interaction is done by members of a COP. In this paper we will focus on innovation activities in a user-centric innovation process that occur when different communities of practices are to share knowledge and innovate an ICT product.

The understanding of user-centric innovation comes from three different fields: user-driven innovation (Hippel 2005); living labs (Eriksson et al. 2005) and open innovation (Chesbrough 2006). All three are examples where a multiplicity of actors, stakeholders and end-users interact in an innovation process. During the interaction an interesting challenge of bridging boundaries at the interface between groups of stakeholders (or communities of practices) occur. In this paper we will refer to this interaction as a boundary dialogue.

The research question here is: What are the characteristics of a boundary dialogue in user-centric innovation activities? The aim of the paper is to propose a model describing the characteristics of boundary dialogue in user-centric innovation that involve different communities of practices such as ICT developers, users and researchers. The empirical data presented in this paper comes from a user-centric innovation project, Free2Ride. From that project we extracted and analyzed three initiatives that were undertaken in the process of developing an innovative ICT system. The project aimed at developing a piece of ICT safety equipment to be used during horse riding. The persons involved in the project were ICT developers, representatives of two equestrian clubs and researchers from Halmstad Living Lab. In the field of innovation of sports equipment, a large proportion of innovation can be traced to user initiatives, for instance in sailing and mountain biking (Raasch et al. 2010).

We use theories of communities of practice to view our different groups of stakeholders as our particular knowledge-based unit to analyze. In our research, each of the stakeholders, i) ICT developers, ii) users (equestrian club members) and iii) researchers is considered one COP. The results reveal that the initiatives are well in accordance with the rationale of a COP perspective. However, in order to function at the boundaries, members need to perform inherent actions internal and external to the community.

The contribution of our research is a model describing the characteristics of boundary dialogue. An important element of that model is the mental wandering, inwards and outwards, of core members in a community. The model highlights the temporal and symbolic nature of the mental wandering during the boundary dialogue in user-centric innovation activities.

The paper is structured as follows: in the next section we present the main theoretical perspectives we take in this study. The following section describes our research approach for participating in the study, the data collection methods and strategies for analyzing the findings. We conclude with a discussion of research findings

COMMUNITIES AND BOUNDARIES IN END USER INNOVATION

This section starts with an overview of user-centric innovation and then takes a closer look at communities of practice and the theory of dialogue. The innovation process in Free2Ride was inspired by user-driven innovation (Hippel 2005; Hippel 2005; Hippel 2007) and the living lab approach (Eriksson et al. 2005). One of the main motives for the approach is that, during the process, we wanted the members from equestrian clubs to be active. User-driven innovation and living lab (Bergvall-Kåreborn et al. 2009) are examples where end users interact with a multiplicity of actors and stakeholders during an innovation process

Communities and boundaries

A community of practice (COP) is a group of people that share a concern (or a set of problems) and deepen their knowledge by interacting on an ongoing basis (Wenger et al. 2002). They find value in their interaction, spend time discussing their situations and needs in order to accumulate knowledge and learn about their community. Learning is described as an ability to negotiate new meanings in a COP, to create engagement in a COP and to deal with boundaries between COPs (Wenger 1999), which means a form of inter-community learning process (Hislop 2004). The inter-community process is important (Cook and Brown 1999) because it helps to overcome some of the problems the community may create for itself (Brown and Duguid 1991). Three different forms of membership is presented (Wenger et al. 2002): *Core members*; *active members* and *peripheral members*. *Core members* are active members that start different projects, a kind of leaders of the community that was involved in the creation of the community. *Active members* are also involved in the projects and different negotiations but are not running projects. The *peripheral members* are more observers of the interaction in the community and are not involved in different projects.

Further, according to Wenger (1998), different types of mediators are defined regarding how barriers can be bridged and knowledge can be co-created across boundaries. Brokering (Wenger 1999) and boundary objects (Star 1990) is therefore a prerequisite for learning between communities of practice. Brokering (introduce elements of practices from one COP into another COP) and boundary objects play an extremely important role as a shortcut to learning among and between different communities of practice (Brown and Duguid 1991; Cook and Brown 1999).

When comparing brokering (Wenger 1999) with boundary spanning (Levina and Vaast 2005) two differences and one similarity arises. The similarity is the use of different boundary objects. The first difference is that brokering go two ways, inwards and outwards and boundary spanning focuses on the inward process. The second difference is that boundary spanning are not taking into account the dynamics of both sides in boundary interaction between communities (Johansson and Snis 2011). Wenger (1999) describes three different types of boundary interaction: *one on one*, *emersion* and *delegations*

Learning in dialogues

The discipline of team learning addresses the boundary issue with the concept of "dialogue". Dialogue is the capacity of members of a team to suspend assumptions and enter into a genuine "thinking together" mode (Senge 1994). To the Greeks, dia-logos meant a free flowing of meaning through a group, allowing the group to discover insight not attainable individually. Dialogue differs from the more common "discussion", which has its roots in "percussion" and "concussion," literally the heaving of ideas back and forth in a winner-takes-all competition. Instead, a "dialogue" takes place when a group "becomes open to the flow of a larger intelligence" (Senge 1994). The purpose of a dialogue is to go beyond any one individual's understanding, and the individuals gain insight that could simply not be achieved individually.

Good community design brings information from outside the community into the dialogue about what the community can achieve. We propose the concept of boundary dialogue between COPs, which means that the community "thinks together" with another COP in order to reach insights not attainable within the COPs. Only the core members can know the latent potential in emerging ideas and techniques. It often takes an outside perspective to help members see the possibilities. Boundary dialogue is a mix of all three boundary interaction grounded in an initiative of one member

RESEARCH APPROACH

Qualitative approaches that have a close co-operation with industry are conceptually and methodologically framed using a variety of terms such as action research (Avison et al. 1999; Baskerville 1999; Baskerville and Myers 2004), action case research (Braa and Vidgen 1995; Vidgen and Braa 1997; Braa and Vidgen 2000), co-generative learning and participatory action research (Elden and Levin 1991), collaborative research (Mathiassen 2002) and engaged research scholarship (Van de Ven 2007; Mathiassen and Nielsen 2008). Collaborative research, participatory action research and engaged research scholarship are primarily concerned with how "outsiders", such as academic researchers, can engage with "insiders", local participants, in ways that somehow meet their often diverse needs. Van de Ven (2007, p.9) defines engaged scholarship as a "participative form of research for obtaining the different perspectives of key stakeholders (researchers, users, clients, sponsors, and practitioners) in studying complex problems" [28]. Four different forms of engaged scholarship are identified: informed basic research, design/evaluation research, collaborative basic research and action research. The last two forms of engaged scholarship, collaborative basic research and action research, are examples where the researcher has the insider perspective (being involved) and takes part in the activities among the different stakeholders. See for example (Lundin et al. 2008).

In our approach we applied a combination of these methodological strategies with an emphasis on engaged research scholarship and action research. Our process was undertaken an inside perspective, in which we as researchers were engaged with (rather than for) practice. We engaged in a relationship (Van de Ven 2007) with practitioners, such as two different communities of practice, i.e. ICT developers and end users from the equestrian clubs. Hence, we realised the connections between the engaged scholarship approach according to Van de Ven (2007) [28] and the theories on communities of practice (Wenger 1999; Wenger and Snyder 2000; Wenger et al. 2002). The action research is built on intervention intended to treat a research problem and a practical problems at the same time, in various phases of the project. The action-oriented activities had to do with balancing between involvement in the research process as well as following and facilitating the user-centric innovation process (McKay and Marshall 2001). Our action-oriented activities were oriented towards the arrangements of various meetings and workshop. In particular, we concentrated on encouraging and supporting sustainable learning processes for collaboration and innovation among the various community members in the project.

Data gathering in the Free2Ride innovation process

The Free2Ride project held 12 workshops with members of all three communities of practice (researchers, ICT developers and equestrian clubs as end users); five meetings between researchers and developers; four field studies at the equestrian clubs; on-line activities that lasted for three months; real life testing/evaluation of the ICT demonstrator; and follow-up interviews after the project (see table 1). The workshops were recorded and notes were taken at some of them, which were also documented by pictures. We took field notes during the meetings and field studies. There were at least two researchers at every workshop or meeting that compared notes afterwards.

Data analysis – a boundary perspective of TFP

The empirical data from the Free2Ride project were analyzed in the framework of communities of practice theories. We identified situations where different community members interacted. The specific concepts of members, boundaries, boundary objects-in-use (Levina and Vaast 2005) and knowledge sharing (Swan et al. 2007) in between members were used to describe what actually happened at the boundaries between communities of practice. In the situations we analysed

activities that were understood as team learning in boundary dialogues (Senge 1994). Three communities of practices were involved (Equestrian Clubs, ICTD and HLL), which all shared the three characteristics of a COP (Wenger 1999; Wenger et al. 2002; Wenger 2006). Equestrian clubs’ practice is horse riding, ICTD’s practice is development of ICT products and HLL’s practice is research.

From the findings we have selected three key initiatives from core members that affected the innovation process to a great extent in terms of boundary interaction and their consequences for further actions and learning in the project. A conceptual model was developed in order to describe and conceptualize the initiatives for understanding the mental wandering between members at the boundaries of different COPs.

Data collection	Descriptions
Field visits	Understanding and documenting the activities that take place in the equestrian clubs
Meetings	The meetings took place between the researchers and the ICT developer and were related to the progress of the project, such as deliverables, project documentation etc.
On-line activities	Blogs, questionnaires, videos and news. All with the possibility to make comments was used during the evaluation
Workshops	12 workshops where at least 15 people from two different communities of practice met and discussed needs and problems in relation to the project
Interviews	Follow-up interviews focusing primarily on questions related to expectations in contrast to the actual outcomes

Table 1: Summary data collection

KEY INITIATIVES IN FREE2RIDE

The domain of the free2ride project

The Free2Ride project was initiated by researchers at Halmstad Living Lab, ICT developers and two equestrian clubs (Laholmsortens Ryttarförening and Hylte Ryttarförening) during the autumn of 2009. The project was granted funding by Vinnova late in 2009 and started soon after that. It lasted 13 months and submitted its report to Vinnova in December 2010. The ICT developers belonged to a company with a background in wireless technologies, especially Bluetooth. The company had before Free2Ride addressed problems related to safety, security and communication in different sport activities such as climbing, sailing, football, bicycling and horse riding.

Activities within the free2ride project

The innovation process adopted in the Free2Ride project followed a structure of six phases based on new ideas from the involved communities of practice: *identifying needs and problems; (re)design; developing conceptual prototypes; evaluating the design concept; developing the ICT demonstrator; and testing the ICT demonstrator*. The six phases were conducted in an iterative manner.

The first phase of the Free2Ride process was to come up with new ideas, which were generated by members of the two equestrian clubs. The three most urgent areas according to the ideas relate to safety during outdoor horse riding, communication during competitions and indoor equestrian training activities. In order to identify the most urgent area, a survey was distributed and used during different horse shows (show jumping, dressage etc). The most urgent area according to the survey was safety during outdoor horse riding.

The second, third and fourth phases focused on creating and evaluating a design specification. Notable is that the design focused on a solution involving two units: a sender and a receiver. The first unit (a sender) should be attached to the horse (Figure 1) on the bridle and communicate through Bluetooth with an application in a cell phone (the second unit) that is

carried by the horse rider (Figure 1). There were some specific requirements for the sender having to do with weight, size, battery lifetime and being waterproof.

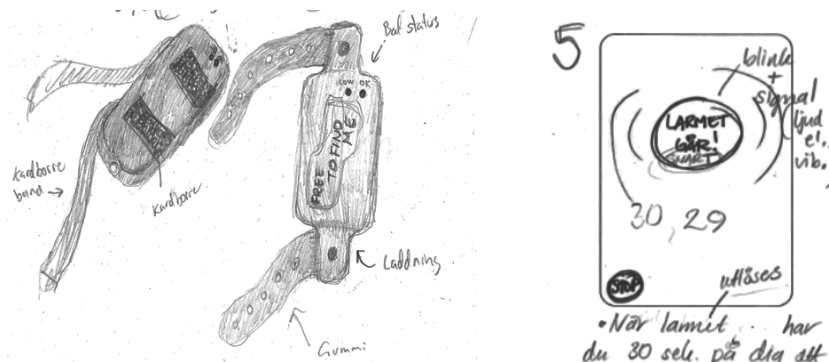


Figure 1: The sender to the left, the interface in the app to the right

In the fifth phase the development of the sender followed the design specification and standard models from ICT developers. The sender was also equipped with a microchip that communicates with a heart rate monitor for horses in order to develop add-on services in the application.

Before the last phase, four pairs of prototypes (IT demonstrator and application) were developed and tested in their natural environment at the equestrian clubs. The test period lasted about four weeks. During this period a test person documented the testing on a blog, where the members of the involved communities of practice could comment on the test. A list of suggested changes to the application and the sender was compiled after the test period.

Key initiatives in the Free2Ride project

We have selected three different situations from the Free2Ride innovation process where an initiative from a core member in the COP led to an open dialogue between two COPs as well as inside a COP. The *drawing initiative* was suggested during the third phase of the project, developing prototypes, by an instructor in an equestrian club. The *interface initiative* was given in the fourth phase, evaluating the design concept, by a project leader and middle manager at the ICT developers. The *video initiative* was brought up in the sixth phase, evaluating the IT demonstrator, by an instructor and a board member of an equestrian club.

The drawing initiative

Before one of the workshops held in the third phase, one of the members of an equestrian club (who was also an instructor) approached the researcher and said that she had some drawings (Figure 2) that she wanted to show the rest of us. When we saw them we rather quickly realized that these drawings were valuable as a starting point for the workshop, instead of what we had planned.

She presented several drawings; one example is the drawing shown in Figure 2. During the presentation of the drawing a free dialogue started about requirements for the IT demonstrator and about riding horses in general.

One of the dialogues deals with the placement of the IT demonstrator on the bridle. The members of the equestrian clubs all agreed that the placement must not disturb the horse and should be viewable from the saddle on the horse. Another dialogue was about how to attach the IT demonstrator on the bridle and how durable the straps that hold the IT demonstrator should be. During this dialogue there was consensus about the needs and requirements of the IT demonstrator (and the straps) on the bridle.

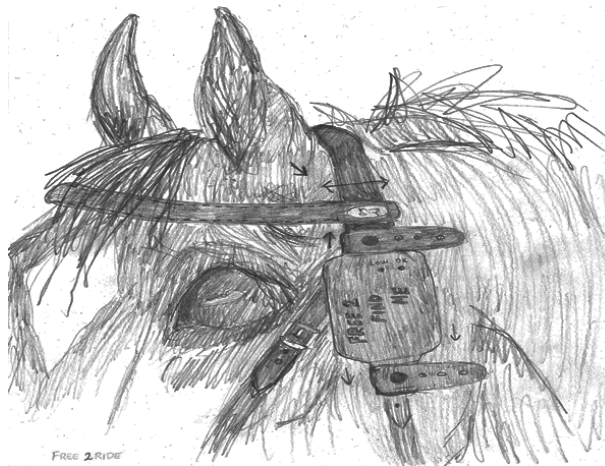


Fig 2: The IT-demonstrator on the bridle

The instructor of the equestrian club is regarded as a core member (Wenger et al. 2002) of a COP (the equestrian clubs) and, by presenting a drawing of a horse, with the IT demonstrator attached to the bridle, she started a dialogue (Senge 1994) on the boundary of her own COP, inviting in core members from another other COP (the ICT developers). The drawing is considered to be a boundary object (Star 1990), used in an outward sense (Wenger 1999). The initiative started a dialogue between COPs that resulted in a shared understanding of the common problem which lead to a dialogue within each of the COPs (equestrian clubs and ICT developers), where the dialogue continued. In a sense, the core members wandered (mentally and socially) to the boundary of their own COP and became peripheral members in the dialogue. After the inter-community dialogue they wandered back to their role as a core members during an intra-community negotiation.

The interface initiative



Figure 3: the first drawing of the interface

During the fourth and fifth phases of the Free2Ride project, evaluating the design concept and the developing of a prototype, one of the core members of the ICT developers understood that it was difficult to realize how the interface would look and function on the smartphone and thus took an initiative to make sketches of the interface (Figure 3).

The drawing of the interface, considered as a boundary object (Star 1990; Levina and Vaast 2005), started a dialogue (Senge 1994) between the communities and triggered a dialogue and negotiation (Wenger 1999) among the equestrian club members. The initiative led to a common understanding of how the interface should look and also triggered questions from equestrian club members about the size of the screen, interactions and logical structure. The first drawing of the interface has similarities to the final version of the interface.

What surprised the actors involved in the Free2Ride project was that the core member of the ICT developers who made the drawing had before this occasion used the language of the members of the equestrian clubs in a very natural way, he acted as a broker (Wenger 1999). On these occasions, the researchers realized that the initiatives invited the members of the equestrian club into a dialogue and that they responded in a positive way to this invitation.

The video initiative

During the last phase of the Free2Ride project, evaluating the IT demonstrator, we used both a video and a blog to document the use of the smartphone application and the IT demonstrator in the real life environment of equestrian club activities. The video was put on the Free2Ride website and was commented upon by the other members of the equestrian clubs' COP, but no comments were given by the ICT developers' COP during that time.

A decision was made to show the video at the last workshop of the project. This led to a dialogue about the problem of false alarms; there are three false alarms in the video (Figure 4). The distance between the horse rider and the horse is approximately one meter, and there is nothing that interferes with the Bluetooth signal between the smartphone and the IT demonstrator. During the dialogue, the core member (Wenger et al. 2002) from the equestrian club talked about the practical use of the devices, the core members from ICT developers talked about the false alarms from a technical perspective and both the COPs were involved in the dialogue (Senge 1994) concerning the device which led to a "to-do list", a negotiated (Wenger 1999) boundary object (Star 1990; Levina and Vaast 2005; Lindgren et al. 2008), with changes to the devices that must be addressed before the product can be commercialized.



Fig 4: End user testing the prototype

After the presentation, the dialogue and the writing of the to-do list, the members of the equestrian clubs started to discuss what will happen with the smartphone application and IT demonstrator. The question started a dialogue on further involvement in the commercialization of the devices. The members of the equestrian clubs wanted to be involved, saying that they were used to working on a volunteer basis and wanted to participate in something that was useful for their sport. The ICT developers were surprised. According to them, finding a dedicated focus group (with core and active members from a COP) is a hard job that often leads to costs.

CONCLUSION AND DISCUSSION

A COP perspective has been found to be successful in analyzing interaction across various groups of stakeholders for knowledge sharing and innovation (Levina and Vaast 2005; Swan et al. 2007). The localization of knowledge in communities of practice, however, while vital for learning, also creates boundaries for interaction and knowledge sharing across communities. The ability to traverse boundaries created by specialized practices is a necessary, although a challenge, for ICT innovation. Our approach has demonstrated that boundaries may not need to be overcome. Interaction and dialogue can be successful even while those involved do not share the same perspective. In a way, the community-based boundaries were subordinated the user-centric innovation process which led to that the communities focused on pursuing new joint interaction to overcome their differences in perspectives. However, the analysis of the key initiatives highlighted the need to focus on ways in which community members mentally wander and where new meanings and perspectives are energized and enable knowledge sharing and innovation across boundaries.

From the key initiatives we can understand that activities taking place at the boundaries are highly dynamic and possess contextual, symbolic and temporal characteristics. Temporally, the dialogue of knowledge sharing and learning started in a temporal zone, where the mental status at both ends is able to energize the subsequent boundary interaction. Symbolically, the dynamic nature of moving mentally from being a core member to being a peripheral member that takes part in a boundary dialogue and then back again to being a core member is described. From a symbolic point of view this meant that actual members of the community worked out conditions and agreements together on a conscious and dynamic basis (Swan et al. 2007). Here, this dialogue is dependent on the initiatives before that wandering and is also related to the negotiation that occurs after the boundary dialogue. (See figure 5).

In figure 5 it is highlighted *six* different elements important for a boundary dialogue. In all three initiatives, a core member takes an *initiative* and creates an artefact that is then used as a *boundary object* (Wenger 1999; Levina and Vaast 2005). The boundary object is brought to and *presented* in a workshop, a mix of Wenger’s (1999) three types of boundary encounters. The presentation of the boundary object captures the *attention* of the core members of the other communities of practice, which leads to a session of *questions and answers*. This is an example of a mental wandering by a core member of a COP to a boundary dialogue between communities of practices. Another effect of the boundary dialogue is that it starts a *negotiation* between members of their particular COP.

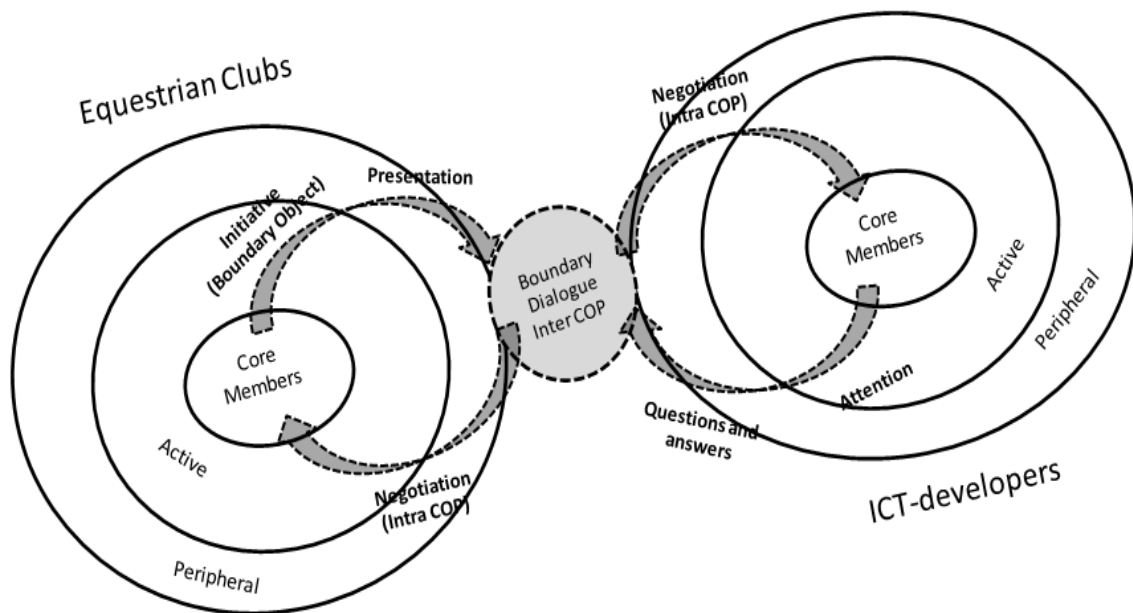


Figure 5: Describing boundary dialogue

Related studies in the COP theory learning is described as primarily going from the boundary to the core, i.e. from external to internal (Cohen and Levinthal 1990; Wenger 1999). From our research we suggest that there is also an outward process undertaken by a core member, mentally ready for a boundary dialogue the triggers negotiation and a shared understanding. In an innovation process, such as the Free2Ride project, the boundaries between users and ICT developers were less distinct –

they were not even important. Instead, there grew a boundary dialogue as an emergent, temporal zone of interaction where symbolic action and interaction took place for the very purpose of gaining a smooth and effective innovation (and learning) process. A boundary dialogue can be a source of a deep kind of learning; radically new insight and developments often arise at the boundaries between communities.

Hence, the research reported in this paper contributes towards and extends the work in this area by drawing upon a COP perspective to enable ways to interact among core, active and peripheral members of a community. We argue that ICT innovation is a process of community interaction that goes inwards and outwards between various community members, regardless of the community to which they belong. In this way we can see that boundaries in themselves are difficult to discern. The key remedy is to pay close attention to boundaries, both to avoid the problems they raise and to take advantage of the opportunities they present. Boundaries are sources of new opportunities. Interacting in a boundary dialogue triggers members to take a fresh look at assumptions within their own COP but it also invites to initiatives to share knowledge between communities.

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